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☆ Chapters 5 and 6 Start here

Bonding: 3 Kinds

- Ionic bonds
- Metallic bonds
- Covalent bonds

Ionic	Covalent	Metallic
form between metals and nonmetals	form between non metals	form only between metals
NaCl Li_2SO_3	big molecules in biology, DNA, glucose, $C_6H_{12}O_6$	Ca and Fe, Li, Bronze CuSn, Brass
Brittle Solids Table Salt	Brittle Solid, sugar cube	Malleable Solids
Soluble in water	sugar, soluble in water	Insoluble in water

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Bonding Types: ⇒ Unique Properties
- Ionic
- Covalent
- Metallic

General Properties:

Ionic Metal + Non Metal	Covalent Non Metals (Metalloids)	Metallic Metals
Brittle	Brittle (some exceptions)	Malleable
Soluable, can dissolve in water	Soluable, Can dissolve in water	In Soluable
Conducts Electricity in solution,	Do Not Conduct Electricity as a solid or as a liquid	Conducts Electricity (flow of e^-)
High Melting Pt.	Low Melting Point	High / Moderately high Melting pt.

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Structure of Ionic Compounds (Xture) is a Crystal Lattice, a highly repeating pattern because one cation bonds to multiple anions over and over again.

Properties of Ions:
- Brittle - breaks off in clean lines, lattice can not bend, it snaps.
- Soluble - because water is a polar molecule
- High melting point - need alot of energy to break all those bonds of the lattice.

NaCl bonds in a 1:1 ratio, is a cubic shape,
different ratios of ions make different shapes.

Metallic Bonding - sea of electrons Model
In Metallic Bonding, the valence e- are shared among all of the atoms that share them.
Communal sharing of e- ⇒ atoms are floating in a sea of e-
Electrons are delocalized - moving around, e- do not belong to any one atom.
Properties of Metals: Malleable, ductile, because atoms are not locked in place,
Conductive - because atoms can pass e-

Covalent Compounds

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Lewis Structures:

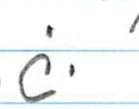
Covalent Compounds: sharing of valence electrons

Example) CH_3I - Iodomethane

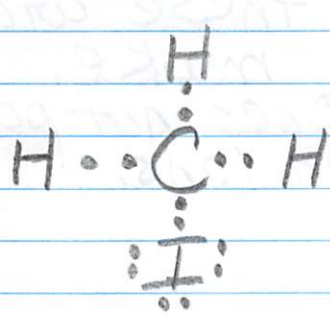
1st - Determine the total # of val e⁻

Carbon - 4 val e⁻
Hydrogen - 3 x 1 = 3 val e⁻
Iodine - 7 val e⁻
TOTAL - 14 val e⁻

2ND - Arrange atoms in a simple layout
Carbon, C, is always in the Middle,
Hydrogen, H, is never in the Middle.



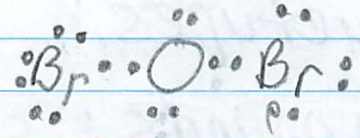
★Octet Rule:
atoms share e⁻ to get 8 e⁻ in their outer shells.



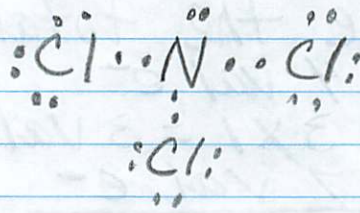
3rd - Pair e⁻ to make bonds
1 bond = 2 e⁻

4th - Make sure all nonmetals have 8 e⁻

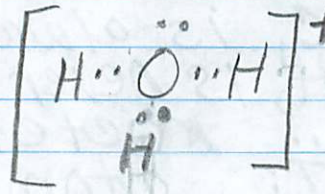
Example) OBr_2 - 20 - 6 Val e⁻
Br - 2 x 7 Val e⁻
TOTAL - 20 Val e⁻



NCl_3 - N - 5 Val e⁻
Cl - 3 x 7 = 21 Val e⁻
Total - 26 Val e⁻



H_3O^+ - Hydronium Ion
positive ion, lost one e⁻



H O N C Rule: how many bonds these atoms make. Does not pertain to ions.
1 2 3 4
(not for ions)

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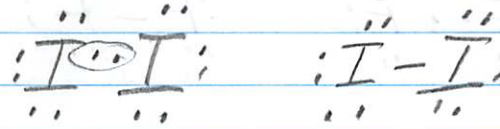
Lewis Dot Structures

Octet Rule

Each atom must have 8 valence electrons when bonded to other atoms. Only Hydrogen - 2 e⁻

Example): I_2 - need to know how many valence e⁻

I has 7 val e⁻

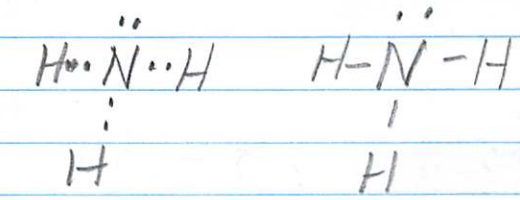


HF

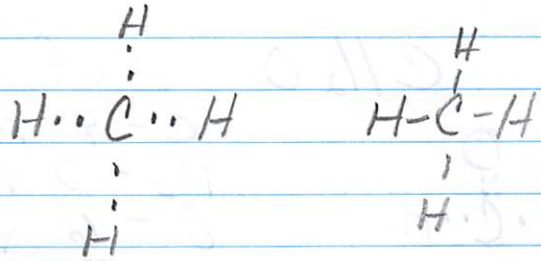
↑ meets octet rule - 8 val e⁻

H has 2 val e⁻

NH_3

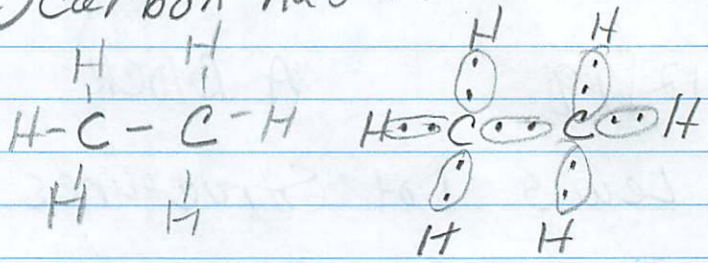


CH_4

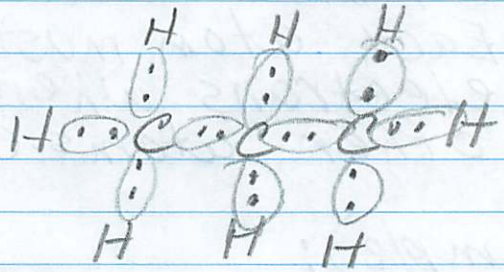


HONC – Bonding Rule
1 2 3 4 # of Bonds these atoms make.
ex) Carbon has to make 4 Bonds

C_2H_6



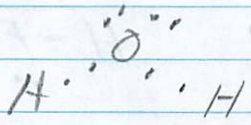
$CH_3CH_2CH_3$



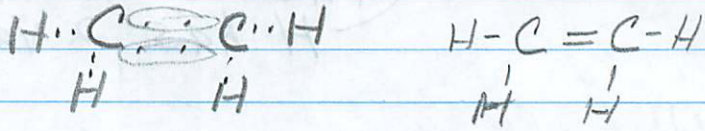
F_2

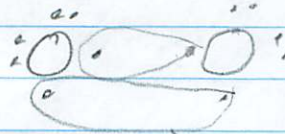
H_2 $H\cdot\cdot H$

H_2O



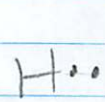
C_2H_2





O_2

Example) CH_2O # of val e⁻



C – 4 val e⁻
H_2 – 2 val e⁻
O – 6 val e⁻
total – 12 val e⁻

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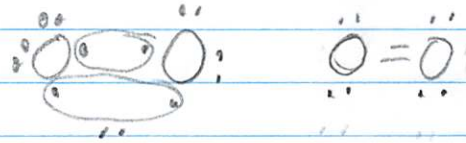
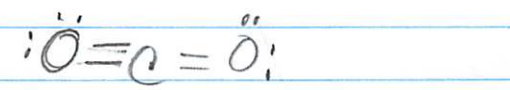
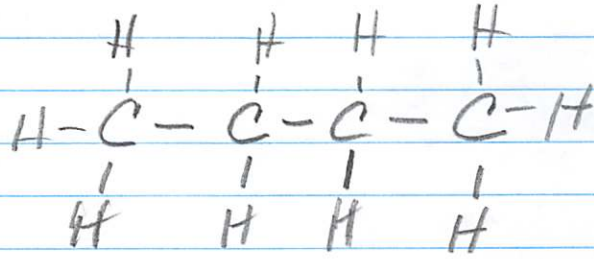
TEST on 12/22 HW due 12/21
Lewis Diagrams
Multiple Bonds

HONC
1234

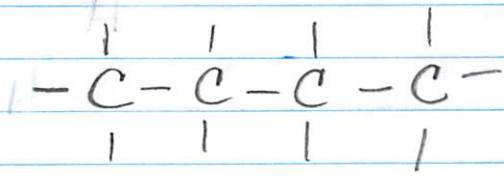
O_2  12 val e⁻

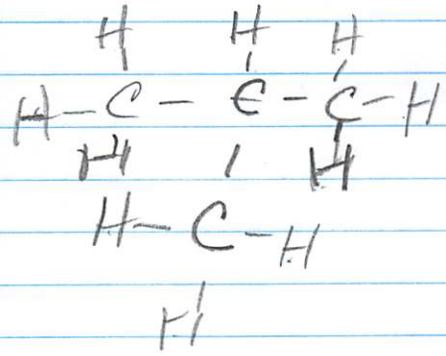
N_2  10 val e⁻

CO_2  16 val e⁻

C_4H_{10} 

Look at Carbon Chain





Isomers of C_4H_{10}

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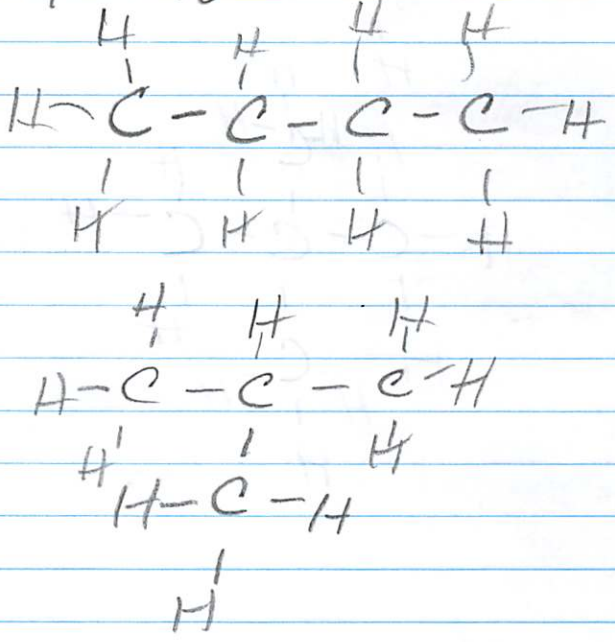
Isomers - Same formula BUT different structures

Examples) C_5H_{12} has three isomers

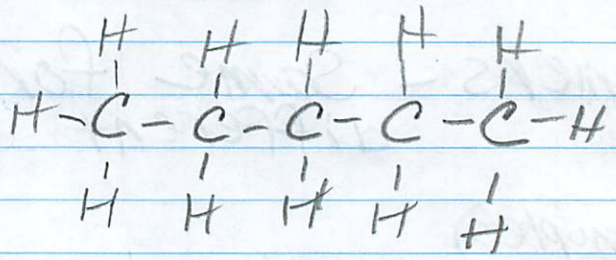
C_3H_3O has three isomers

Draw C_4H_{10}

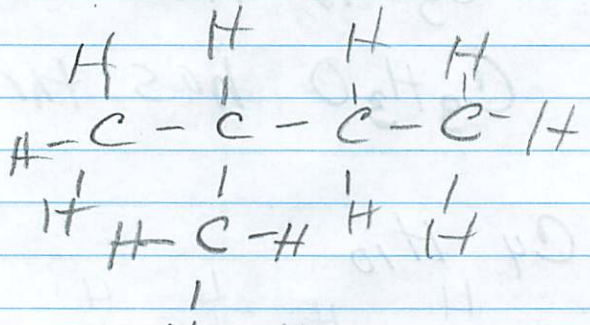


C_5H_{12} 3 isomers

(1)



(2)



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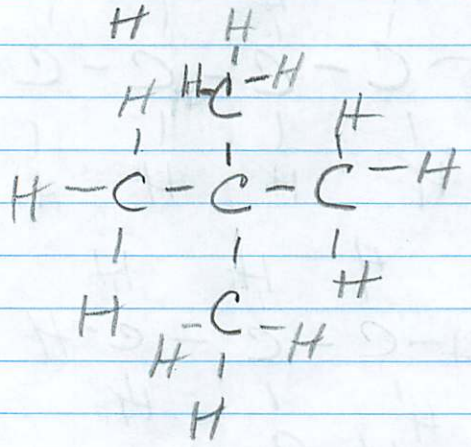
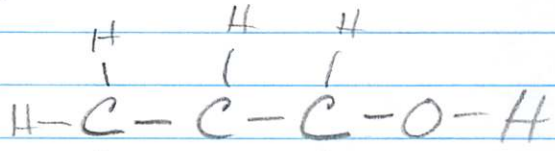
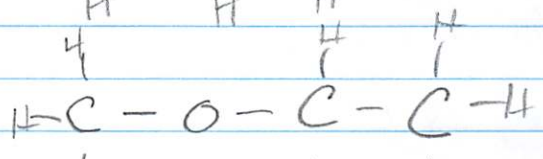


$C_3 H_8 O$ 3 isomers

① 

② 

③